The Use of Oxygen in Amounts of 6 and 8 Mg/L in the Main Fermentation of Beer

Zymology

Keywords: oxygen, beer, extracts, fermentation, longevity.

Arsim Elshani		**J.S.C."Birra Peja", Production Engineering Department, Pejë – Kosovo.**
Kastriot Pehlivani		**J.S.C."Birra Peja", Production & Technical Manager, Pejë – Kosovo.**
Nexhdet Shala		**J.S.C."Birra Peja", Production Engineering Department, Pejë--Kosovo.**

Abstract

As far as beer is concerned, oxygen represents both a friend and foe. As it is much needed especially during the fermentation process, so it should be also completely eliminated its contact with the beer during transfer from one tank to another of the finished beer and during packaging in bottles, cans or barrels. It is very important to understand when it oxygen is needed, and vice versa. And where aeration or oxygenation process is necessary as for example during fermentation it should be a wine aeration or oxygenation within the allowed certain criteria. The stability of the taste of beer remains a key point throughout all beer producing factories. Hundreds ingredients, form a complex matrix of beer and of course chemical reactions lead to changes in the composition of the beer as well as the characteristics associated with taste and smell. Among the many ways of decomposition, in particular the quality of the beer is harmful, the volatility of iso-alpha-acids that are key derivatives that serve as distressful agents in the beer.

Introduction

Regarding the cooling phase of the beer and filling the tank for its fermentation it is conveyed the cooling action and cooling time. The objective was the cooking process and the fermentation which have been developed according to the given criteria from the literature of well-known authors. In the stage of fermentation of a new beer, after giving the oxygen in amounts ranging from 6, then 8, 10 and 12 mg / l it was taken the beer for different analysis, and comparisons are made with results obtained through the beer reference. As an objective we had the influence of the given oxygen in the fermentation of the beer, to acquire a tasteful and good flavored beer. Whereas in the maturated beer is followed the maturation beer process, starting from the beer awakening and its saturation with CO2. The main objective has been whether it is necessary the possession of the proper removal of the precipitate of the yeast out of a tank and with CO2.

Methods

Table 1. Analysis of green beer with supplying oxygen in amounts of 6 mg / l.

The basic extract	Real extract	Visible extract	The rapid rate of fermentation	The apparent rate of fermentation	alcohol	pH
%	%	%	%	%	% v/v	
15.2	5.22	3.31	60.8	75.54	5.7	4.45
13.3	4.99	2.98	61.51	78.8	5.6	4.51
11.5	3.25	1.86	71.17	79.8	5.1	4.38

In Table 1 it is given a summary of the analysis for the new beer, with the amount of oxygen 6 mg / l in the main fermentation, in order to determine the appropriate quantity of wine fermentation with yeast extract

from 15%, 13% and 11.3%. We note a lower value instance of rapid fermentation and apparent degree of fermentation.

Table 2. Analysis of beer finished with oxygen amounts of 6 mg / l.

The basic extract	Real extract	Visible extract	The rapid rate of fermentation	The apparent rate of fermentation	alcohol	CO_2	color	bitterness	O_2 measured	O_2 total	poluphenols	pH
%	%	%	%	%	% v/v	g/l	EBC	EBC	mg/l		mg/l	
15.2 10.90	3.22	1.73	64.61	79.15	4.6	5.3	7.5	21	0.18	0.35	122	4.42
13.3 10.41	3.43	1.95	65.58	78.75	4.7	5.2	8.0	22	0.10	0.20	120	4.31
11.5 10.55	3.31	1.88	64.38	77.15	4.5	5.0	8.2	22	0.15	0.30	115	4.32

In table 2, we have presented the analysis of the ready beer with the basic extract of 15%, 13% and 11.3%, but for the sale the beer is degassed with diluted water (with the amount of oxygen 0.002 mg / l) in the extract of 10.5%.

We also note:

• reduced value of the rapid rate of fermentation and the apparent degree of fermentation, in all three cases.
• Alcohol in normal values for these extracts.
• CO2 content in the appropriate values.
• Color also in required values.
• measured and dissolved oxygen in acceptable quantities.
• poluphenols in an amount of about 120 mg / l, received.

Table 3. Analysis of green beer with supplying oxygen in amounts of 8 mg / l.

The basic extract	Really extract	Visible extract	The rapid rate of fermentation	The apparent rate of fermentation	alcohol	pH
%	%	%	%	%	% v/v	
15.6	5.95	3.66	63.8	76.54	6.51	4.43
14.81	5.22	2.95	66.51	80.08	6.43	4.34
11.51	3.68	1.82	69.27	84.13	5.13	4.23

In table 3, analyses of the new brewery are presented by supplying it with oxygen of 8 mg/l, in fermentation. And we note the rapid and visible scale of fermentation in nominal values, if we refer to the guidelines of the European Convention for beer.

Table 4. Analysis of beer finished with oxygen amounts of 8 mg / l.

The basic extract	Really extract	Visible extract	The rapid of fermentatio	The apparent of rate	alcohol	CO_2	color	bitterness	O_2 measured	O_2 total	poluphenols	pH
%	%	%	%	%	% v/v	g/l	EBC	EBC	mg/l		mg/l	
15.6 10.82	3.64	1.93	67.61	82.16	4.69	5.3	8	22	0.14	0.3	128	4.43
14.8111.31	3.82	2.03	67.58	82.04	4.91	5.2	8.5	22	0.09	0.18	127	4.35
11.5111.11	3.74	1.98	67.66	82.17	4.82	4.9	8.4	21	0.13	0.27	124	4.40

In table 4, analysis of ready beer are presented with extracts of 15%, 13% and 11.3%, with the amount of oxygen carved in fermentation of 8 mg / l. and these changes were noticed:

- The expected value of the real and visible extract,
- Also, values of the rapid and significant degree of fermentation,
- Alcohol in appropriate amounts for these values,
- Sufficient CO_2,
- Proper color,
- Good Grief
- measured oxygen and well dissolved, and
- accepted poluphenols.

Interpretation of Results

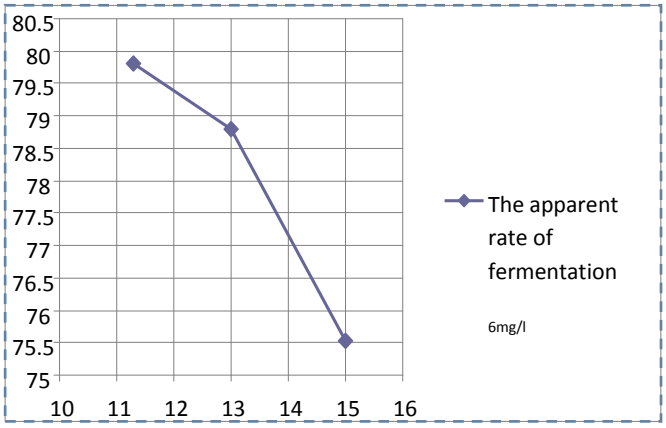

Figure 1. Apparent rate of new beer fermentation, the amount of 6 mg / l in extracts of 15%, 13% and 11.3%.

In the graph shown in Figure 1, we presented the visible scale of fermentation for the new beer, and that with extract of 15%, 13%, and 11.3%, where it is seen a lower value of this scale of apparent fermentation for the three mentioned extracts.

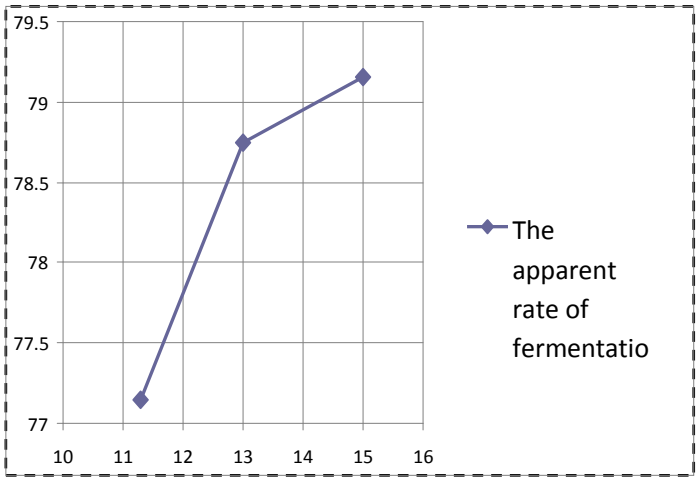

Figure 2. Apparent rate of fermentation of beer ready, equal to 6 mg / l in extracts of 15%, 13% and 11.3%.

In Figure 2, we have shown the apparent scale diagram of the fermentation for the ready bear with the amount of oxygen from 6 mg / l given in the fermentation of beer, and thus we noted:

- In beer with the extract of 15% of the apparent scale of fermentation 70.15%,
- In beer with the extract of 13%, the apparent scale of fermentation 78.75%, and
- In beet with the extract of 11.3%, the apparent scale fermentation 77.15%.

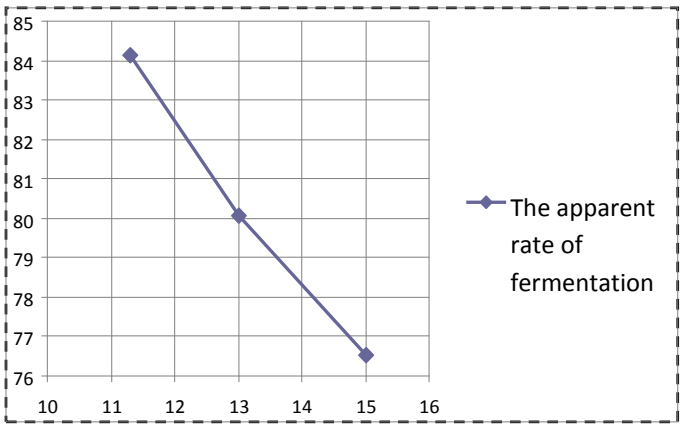

Figure 3. Apparent rate of fermentation for the new beer, amount of 8 mg / l in extracts of 15%, 13% and 11.3%.

In figure 3, it is shown the apparent graph of the degree of fermentation of the new beer with extract of 15%, 13% and 11.3% and the amount of oxygen in the fermentation of 8 mg / l.

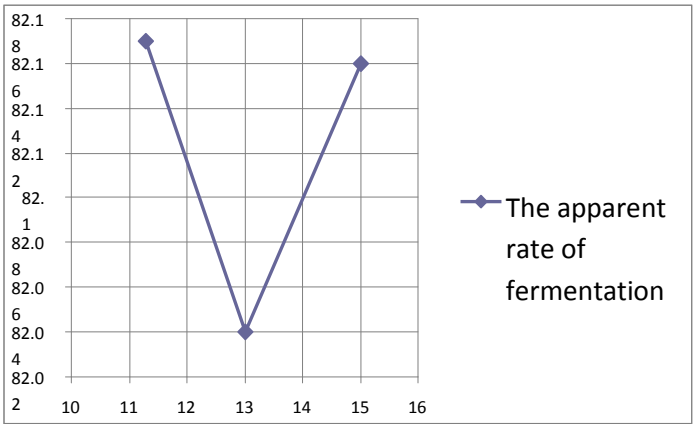

Figure 4. Apparent rate of fermentation of beer ready, equal to 8 mg / l in extracts of 15%, 13% and 11.3%.

In figure 4, it is shown the apparent graph instance of the ready beer with the oxygen amount of 8 mg / l, in extracts of 15%, 13% and 11.3%, and it is noted that for:

- Extract 15% we have an apparent scale of fermentation 82.16%,
- Extract 13% we have an apparent scale of fermentation 82.04%, and
- Extract 11.3% we have an apparent scale of fermentation 82.17%.

References

1. Wolfgang Kunze, Technology Brewing and Malting, VLB Berlin, 2004.
2. European Brewery Convention; Manual of good practice; Hops and hop products.
3. European Brewery Convention; Analytica EBC. 2010.
4. European Brewery Convention; Manual of good practice; Vol.5, Beer Filtration, Stabilisation and Sterilization.
5. European Brewery Convention; Manual of good practice; Vol. 6. Malting Technology.
6. European Brewery Convention; Manual of good practice; Vol. 7, Fermentation and Maturation.
7. European Brewery Convention; Manual of good practice;Vol.9, Wort boiling and Clarification.
8. European Brewery Convention; Manual of good practice; Vol.11, Brewery Effluent.
9. European Brewery Convention; Manual of good practice; Vol.12, Quality.
10. European Brewery Convention; Manual of good practice; Vol.13, Mashing and Mash Separation.
11. MEBAK, Brautechnick Untersuchungsmethoden Bd.1, S.18-19
12. MEBAK, Brautechnische Analysemethoden**.** Band 2: Würze, Bier und Biermischgetränke 2002.